LIBRARY EXPEDIENTS IN MICROSCOPY.

INDEXING, CATALOGUING, PREPARING AND ARRANGING LITERATURE AND SLIDES.

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INDEXING.

The advantages of indexing as a library expedient are obvious, universally known, and almost entirely neglected. Even within the limits of an ordinary private library, the constantly increasing mass of useful matter, mixed with and lost in a far greater amount that is practically worthless to the owner, soon outgrows the capacity of the memory to utilize it adequately; to search for it without a guide soon becomes impracticable, to find it by means of the indexes in the various volumes, if there are any, is necessarily tiresome, and also distracting and inconclusive by reason of the alphabetical arrangement where no sensible association of ideas leads and assists the mind, and where the most important material may be overlooked by uncertainty as to the exact words used by an author as a designation. To a thinker the table of contents at the beginning of a volume is a much more agreeable and useful study than the alphabetical index at the close, and it is often the best aid in searching the volume for some desired assistance. The general indexes published at longer intervals by some serials, as our own Proceedings, or collated as in some commercial enterprises, are a valuable assistance but only of limited availability. A general index, like Poole's, which with all its limitations is invaluable, can only apply to some limited field in literature; is almost inevitably subject to the absurdity of alphabetical arrangement, and is necessarily more or less obsolete, and greatly

so unless by depending on frequent supplements by which its utility is proportionately reduced.

It may be safely said that any owner of a library, who desires to cultivate any specialty, or indeed to do any literary or scientific work beyond merely reading for the passing pleasure of doing it, ought to incorporate with the subject-catalogue of his volumes, index-references to such chapters, sections or passages, large or small, if not adequately included in the title of the volumes, as he may reasonably expect to wish to refer to, or be reminded of, in the future. Naturally a specialist will include freely references beyond the limits of his own library; and the index will have become, when arranged more or less sensibly, a general catalogue of literary material available and important to himself. This is evidently the substitute, adapted to present conditions, for the wholesale copying of valuable extracts into an index-rerum a generation ago.

CATALOGUING.

For extensive work of this kind a card catalogue is indispensable; and short extracts or hints are much more available if copied onto the cards. It may also be added that important fragmentary notes or memoranda of personal observations or suggestions, or any such information likely to be required for future use, should be written upon cards and classified with the rest.

Of course the cards of the Concilium Bibliographicum at Zürich, and the forthcoming international catalogues of scientific literature, do now, or will in the near future, assist in this work, but not to the exclusion of individual effort; though the early, not to say hasty, repudiation, in the latter case, of any effort to make the enterprise conformable to the decimal system of classification which a rapidly increasing number of us have used extensively with great convenience and profit, is, to speak too mildly, a very great disappointment and discouragement.

Microscopical slides should be catalogued and indexed with the same care, in the same spirit and to the same results, as books or notes; the identical index numbers being used, as a

matter of course. Naturally they require the same cross references to points that are important elsewhere than in the groups where the slide has been, on the whole, most advantageously located. There is no objection to using a standard card catalogue for this purpose, except the great waste of room by using cards so much larger than required. Cards 25x75 mm. are amply sufficient, and if not too numerous they may be most conveniently distributed in their proper places among the slides in the object cabinet. If inconveniently many for that, they will occupy but little room when packed in boxes as a card catalogue. Where very few are required, dummy slides may be used, having no mount, but only a label telling in what mount (stating always the index number as well as title) the object can be seen.

PREPARATION OF UNBOUND LITERATURE.

For a public reference library, and for the works in his own line in the private library of a professional man or a specialist, there seems to be no shorter road, royal or plebeian, to the exhaustive results required than the system of cataloguing and indexing hitherto described. The specialist cannot reduce the growing bulk of his outfit by discarding anything in his specialty. Thus the professional microscopist would desire to possess, so far as possible, full sets of every microscopical journal ever published in his own country, and of the most characteristic foreign ones, however much comparatively unimportant matter they might contain; as he can never know when he might wish to refer to something that was formerly considered insignificant. And the same immunity from condensation may well be extended to some but not all of the other, somewhat allied, scientific journals in which he feels most interested.

But in building up his own library one can do far better than this in regard to much of the material that constantly presents itself incidentally. In the mass of mixed literature in the form of general magazines, reports, and various publications that are largely of superficial and temporary value, if any, and which are commonly thrown away when the next number appears,

there are, occasionally, portions that are of permanent value, varying in length from a portion of a page, or a cut, up to an elaborate article. If these old numbers are laid aside on the shelves for future use, read or unread, bound or unbound, the useful portions soon become buried in so great a mass of worthless material as to be practically and finally lost unless promptly and thoroughly catalogued by cards; and then the result is so cumbersome that the effort is soon abandoned and an opportunity to acquire an invaluable library is gone. The fact is, according to common observation and experience, that bound sets of ordinary non-professional journals, reports, etc., are among the most unused, and therefore to most persons and for most purposes the most worthless, portions of libraries, excepting only public reference and private specialists' libraries, and small private libraries that contain little else; while the really valuable parts, separated from the rest, may be made one of the most used and useful portions. The remedy for this embarrassment is simple, easy and obvious, but so radical that scarcely anybody seems to think of it, and still less to venture to do it after hearing it recommended. It is merely to keep what is wanted, and keep it in useful form, and discard what is not wanted, without regretting the loss of what is only a burden, or longing for the grand row of volumes the material would make if handsomely bound—at a handsome cost—while well knowing that if the same set, bound, were offered for sale at the cost of binding, the offer would not be considered for a moment. Instead, take them all to pieces, glean out all that might be of future interest to one's self or to anyone likely to come in contact with the collection; and instead of a cart-load, mostly rubbish for all future use, there will remain a handful, more or less, that will be valuable unless spoiled by bad management in rebinding. How far it is wise to apply this radical method will obviously depend upon the taste, judgment and requirements of the person interested.

My own first experience in this direction, some thirty years ago, was most suggestive; and the one lesson proved enough. Having a pile of numbers of one of the miscellaneous maga-

zines ready for the binder, it occurred to me to discard portions not wanted and which were not worth house-room, a plan confirmed by a hasty review of a few numbers. The whole pile was dismounted, and the result gave four or five volumes of valuable material, bound up according to the fashion of the time, instead of some three yards of mostly wasted shelf-room. Had the whole set been bound, scarcely a volume would have been taken from the shelf, to this day, except for dusting; while the condensed volumes have been really useful, and would have been far more so but for being spoiled by binding. For years they have been awaiting a convenient time to be taken to pieces, for the individual classification and use of the various papers. Since then I have never been thoughtless enough to fasten together pamphlets that would be more useful apart.

Naturally the same might be said of pasted scrap-books, and of note-books as ordinarily written. Generally, as of bound pamphlets, all they are good for is to be cut up and classified by subjects. This is provided for, however, in some cases, by the note-books where clippings are placed loosely in pockets or envelopes; and by notes written always on separate sheets that can be rearranged at will. The latter can be handsomely accomplished by writing on sheets perforated for tying together near the left margin, like the so-called sermon paper. Slips of card catalogue size would naturally be used for purposes within the limit of their capacity.

It is probably the general belief and experience that unbound literature is a nuisance; and great quantities of it that are really valuable—greater to-day than ever before—are daily thrown away. I hope to be able to convince some of those interested in the subject that it would be at least as nearly true to say that it is the only literature of permanent value that is not more or less of a nuisance. Clearly the aim should be to make everything of the kind a unit, described by a single and simple title that accurately characterizes it; as the fancy titles that give no idea of the subject, which are now so much affected by some otherwise decent journals, are silly, troublesome and disgusting.

Authors' separates or reprints of valuable articles on definite subjects, that can be handled and classified independently, are the ideal literature of our day, and the more other things that can be got into the same state of utility, the better. Such a collection, when properly classified, is its own index and its own catalogue. Everything it contains is available with a minimum of trouble.

STORAGE OF UNBOUND LITERATURE.

If only a few things of special importance are to be preserved, those of all sizes from small clippings or memoranda to octavo pamphlets can best be distributed by subjects into stout manila envelopes, and these properly classified between the books of the library, taking care to use envelopes slightly taller than the adjacent books, in order that they be not lost from sight between them; while quartos and larger would be piled horizontally at the ends of some shelves. The familiar sets of envelopes tied into covers, to be handled and stored like note-books, are perhaps convenient for holding a few small scraps; though only in some special cases can they well become a part of an extensive system, as they complicate and embarrass the classification.

For somewhat larger collections, the various sorts of book-like pamphlet cases, to stand on the shelves among the books, and always with covers to exclude dust, would be used instead of envelopes, for pamphlets and extracts of similar size; while the smaller scraps would, in any event, remain in envelopes, and the envelopes, titled and indexed according to their contents, would thereafter be treated exactly as pamphlets on the subjects so indicated.

Pamphlet-cases, however, are clumsy, and waste much room; are awkward to open, empty and repack, unless made to open with a hinge motion at the back instead of a removable cover; are costly if of good quality and used in large quantities; and preserve the contents in poor shape, by reason of the frail papers settling down, by the effect of gravity, during long standing on one end, unless some troublesome arrangement or apparatus be

adopted to keep the boxes always stuffed full or the contents pressed firmly against one side.

For large collections the pigeon-hole method seems incomparable, and the writer was glad to abandon everything else many years ago. The pamphlets of every kind, including the envelopes of small clippings or notes, are most perfectly preserved and most rapidly handled, and the space appropriated is most completely utilized. Ordinary book-cases will be found a convenient receptacle. For a beginning a few shelves will suffice; the writer's collection fills five large cases. The shelves should be set about three inches apart; and they should be at least twelve inches wide, which will hold folios lying lengthwise, and smaller sizes crosswise. There is no objection to completing the pigeon-holes by having thin wooden partitions built-in vertically, except that the arrangement is inflexible, causing waste of room and interference with classification. It is far better to leave the shelves wholly free, stacking the material in piles as it will best go in. A careful person can use the piles unprotected without difficulty, or each pile can be tied into a bundle with a small string; but it is best to have movable partitions of sheet tin-plate or other metal, not too clumsy but stout enough to maintain their shape. The sheets are cut 5 or 6 inches wider than required, and the surplus part is bent at right angles, like an L or flange, to lie upon the shelf, where the pamphlets piled upon it hold it firmly enough to keep the whole arrangement wherever it is put.

Of course every pile has on the edge of the shelf beneath it a label announcing its subject and index number; and as these numbers follow each other in regular series throughout the collection, the whole is delightfully simple, sensible, and available, whether it contains a hundred entries or a hundred thousand. The labels must be capable of instant shifting. Label holders that can be bought are often too wide for the thickness of the shelves. A neat substitute is to slip the cards, carefully cut to size, behind the heads of large-headed brass tacks driven just far enough to leave room for the card. For a rectangular card two tacks below and one at each end are required; but the end

tacks alone will suffice if the card be suitably notched near the ends, to straddle them. Even a strip of heavy, tough paper lying on the shelf under each pile, projecting in front as much as the thickness of the shelf and bent down in front of it to serve as a label, will suffice.

The great variety of sizes to be shelved without nullifying the classification presents some important problems. As a rule every page should lie flat without folding, and widely different sizes do not stack well together; but many exceptions may profitably be made. If there were in a certain group a large number each of octavo, quarto and folio sizes, it would be best to make three stacks, locating intermediate sizes with the next larger; but if nearly all were quartos, the few folios might be folded (unless having valuable illustrations) and laid in, and the few octavos also inserted, making one series of all. Several smaller scraps from the envelopes, or that would otherwise go there, may often be gummed to a larger paper to which they practically belong; or several of them on an identical subject be gummed lightly (but not irrevocably) inside of a single-fold sheet of note or letter paper, for instance, for convenient classification among others on the same subject.

ARRANGEMENT.

Books, pamphlets, slides, and their catalogues may be arranged either with or without classification. In serial arrangement, without classification, they are numbered, and permanently located in regular order as acquired. Such a catalogue of accessions is the book-list kept, perhaps, by most of careful owners of private libraries. It is useful by reason of incidental memoranda added, and as a means of assigning and recording the serial numbers written in each volume, by which the individual volumes can be referred to. It seems scarcely worth while to include unbound literature in this list, except, perhaps, pamphlets of unusual importance. In case of slides, this list, by leaving ample space to each number, with or without a printed form to fill up, is made to contain any amount of information, simple or elaborate, that may be required by the owner, as to

the history, character and treatment of the material and its mount.

Obviously both books and slides might be thus arranged, but the former probably seldom are, by beginners, unless thoughtlessly. In later experience it is not rare to see recent acquisitions stuffed in at the unoccupied ends of the shelves without regard to anything else. This intellectually slovenly habit will be excused, if questioned, by the plea that they are thus more easily gotten at; but it may be safely inferred, in most of such cases, that the rest of the library is little if ever used.

Such an arrangement of slides, however, has been seriously advocated, and is used by some persons. It is argued that as a perfectly natural or satisfactory classification is unattainable, and as it must be supplemented by a reference catalogue as an assistance in finding what is required (always except in the decimal classification), therefore no classification should be attempted, but every slide be located at once and finally in the first vacant space in the drawers, to be found only by catalogue thereafter. The same argument would apply equally to books, and the plan, though not perhaps used for them as a whole, seems to be often employed to supplement a rough and unsatisfactory classification. Whatever advantages such a plan might have, for books or slides, in a great public collection where the objects called for are to be collected and brought to the user by a paid employe, who has nothing to do but to get the things as ordered and afterward to return them to their places, it seems to me beyond reasonable question that every private owner of literature or slides should, for pleasure of handling and for educational effect, have his collection classified in the most rational manner, so that the whole will present itself to his eye and mind as a harmonious whole; each section of it presenting, so far as possible, all that he has at command in regard to its particular subject, and standing adjacent to those most nearly related to itself.

CLASSIFICATION.

Classified arrangement may be based on various characteristics. Buyers of books as furniture often classify them by

size, color, or elegance of binding. In such cases, the traditional board in front of each shelf, covered with the representation of the backs of a row of books tooled upon it by a bookbinder, would be preferable; as the purchase for such uses of a set of books, or even a set of dummies representing books, seems a needless extravagance. A cabinet of microscopical slides is sometimes, though perhaps less often, deserving of a similar criticism; but at worst it does generally serve to amuse its owner, which the books referred to do not.

Equally artificial, and only somewhat less unsatisfying, is the venerable alphabetical classification, where the available sections depend wholly upon the combination of letters in words. As the number of such combinations is well nigh infinite, the capacity of the system is indisputably great; and it is still largely employed in libraries. Requiring only the intelligence to recognize the letters of the words and compare their sequence, and leading with mechanical certainty to the object when its name is exactly known, it is claimed to be especially suitable for large public libraries where attendants are employed to bring forward the items called for. When the student does not know exactly what to call for, so much the worse for the student. Probably the attendants, unfamiliar with his exact wants, will assist him as much as they can, but he, at best, is working at a great disadvantage. Exactly in this line, and, so far as it goes, confirming its conclusions, is the recent experience of some of the smaller libraries where the alcoves have been freely thrown open to the public, and all readers have been allowed to loiter among the books shelved on the Dewey system, and to select what they choose after seeing what is offered in any groups which may attract them. To an outside observer this seems to greatly increase the capacity of the library as an educational agency; and it is cordially commended by some, at least, of the officials who have employed it. Alphabetical distribution should, in my judgment, be used as little as possible and as a last resort, in small groups, after a rational subdivision has been carried as far as practicable. As an artificial key it should be tolerated, not courted.

Alphabetical classification by authors, either separate or combined in same series with a subject classification, as a key, is a familiar library expedient partly natural but largely artificial. To the microscopist it may be chiefly useful as a check-list of his library, showing which works of each author listed he possesses and which are still desiderata. The most advisable way of preparing such a list, for private use, is to buy such books as F. C. S. Roper's Catalogue of Works on the Microscope, Julien Deby's Bibliotheca Debyana, etc., check the items that are possessed, and write on the blank pages those acquired but not in the list. If an interleaved copy cannot be obtained, it will of course be necessary to have a copy rebound with blank leaves between all the pages. Such a list, being compact and easily handled, is more convenient for frequent use than the more clumsy card catalogue.

The only classification that commends itself to a philosophical mind is by subjects. It should also be a reasonable and practical working system. We need not wait a few centuries more, before beginning, until philosophers have agreed upon the exact relations of all classes of knowledge, nor necessarily begin our scheme with everything pertaining to that part of eternity that preceded the creation of the universe. The indispensable requisite is to have a convenient number, not too many, of convenient classes, conveniently grouped together, with a few great lines of thought running through them, and radiating out into a convenient number of branches that are capable of likewise branching, without limit. This naturally groups together, throughout, that material that will most probably be thought of and studied together; and the location of the material will be naturally led to by the trains of thought occupying the mind at the time it is wanted. This is perfectly simple and obvious, now that it is understood; but it could not have been so stated before the appearance of the decimal system of classification both supplied and elucidated the need.

Many years ago the writer undertook, as doubtless many others did, rather instinctively than conscious of the full effect to be attained, to reach this end by working as numerals the

alphabetical letters used in designating the alcoves or other divisions in libraries. This of course produced a twenty-five unit (dropping one letter for the sake of a round number) numerical system, of stupendous proportions, putting quite out of sight the world's little decimal system and the imaginary duodecimal system a longing for which occasionally makes its appearance somewhere. This gave correspondingly grand effects, the first subdivision furnishing over 600 groups, and the third, using only four figures (letter symbols) supplying nearly 400,000. The scheme was soon dropped as too awkward and clumsy for practical use. The employment of letters as figures was not only awkward at first, because of its unfamiliarity, but permanently awkward and liable to errors, from the constant dual use of the symbols (letters) with the confusing and misleading character of the word-like combinations produced; while the groups were too large for convenient memorization, and a burden instead of an aid to the mind seeking light on a particular subject. Why I did not instantly step to the logical conclusion of adopting the familiar decimal system of numerals would be as difficult to explain as it was obviously and confessedly stupid. It is only possible now to claim the common though impecunious excuse that it was no more stupid than other people were. When Melvil Dewey, now Director of the library of the State of New York, proposed to use figures with decimals for this purpose, it was evident enough that this was what was wanted. The figures were among the most familiar things in the world and were used in perfectly simple, direct manner; a few more figures would be required in some cases than with a system capable of multiplying or dividing by 25's, but figures are so familiar to educated people and are so easily handled, that a few more or less are of little importance, and of none compared with the awkwardness of handling much larger groups. And a collection thus managed may be kept always fresh and modern, like the boy's old jack-knife that was always the same familiar and serviceable knife, however many of its parts may have been changed by repairs and renewals. Practical duplicates may be weeded out whenever desired, obsolete

pieces may be thrown out, or retained for historical purposes, new material may be added at all times and to any extent, without trouble or confusion. The scheme is simply an unlimited system, that never can be full, always open at every point for any use that may be desired by anybody.

As to the alleged difficulties and impractical character of the system, even a novice having a little literary experience can readily locate his material with some assistance from the synopsis about to be presented.

This seems, to my mind, to be true beyond reasonable question; or would seem so were it not that since this paper was written, and long after its principles had been publicly advocated and notoriously vindicated by a successful and growing use, some highly honored persons, of great character and authority, and of great experience and ability on other lines, have apparently found conservatism irresistible, have been unable to admit the success of so radical an innovation, and have thought it necessary to place a great international enterprise of which they are the honored leaders directly in the way of a successful improvement which is already far advanced in introduction, and which, so far as publicly known, seems to have been agreeable and profitable to those who have used it, and formidable mainly to those who have not.

Though the elaboration of such a scheme is a work of vast complexity and almost unequalled difficulties, it is only justice to say that Mr. Dewey's presentation is remarkable as an ingenious and thorough literary work and practicable as a working manual, equally available for catalogue and for shelving purposes. For general work, exclusive of specialties, it seems to leave remarkably little, considering the circumstances, to be regretted or desired. Its faults are those inherent in any work of broad scope and somewhat permanent character. In the class 5, for instance, of natural science, the material is subdivided in a manner that, needless quibbles aside, is intelligible, convenient and adequate for most well-balanced libraries intended for general use.

But a specialist, as such, is not well balanced and cannot be; neither is his library. He has chosen to over-develop himself in one or more lines, and his resources must be made to correspond. He would desire to have at command, so far as possible, everything having an important relation to his specialty. A botanist, for instance, will locate among his professional material, in thought and in housing, things that a chemist, a zoologist or a sanitarian would likewise be interested to place in his own special group. Much additional difficulty is presented by the fragmentary notes and clippings pertaining to fine points, that require a greatly extended subdivision of classes to be really available when wanted.

Especially is this true of such a specialty as Microscopy, which, while small, at least in the suggestion of its name, has relations to a great many lines of human activity and interest. Books, pamphlets, etc., that are possessed solely or even mainly for their value in microscopical chemistry, botany, zoology, etc., from in fact nearly every division of Dewey's classes 5 and 6, and many from beyond those limits, must be at hand in the microscopical library and not scattered among thousands of other books in various parts of the house; or, at least, these and others not owned must be included in the microscopical catalogue, so as to be not only found with a minimum of trouble, but suggested without the labor and uncertainties of search, when wanted. This suggestiveness, which is inherent in the Dewey method, is an invaluable though undervalued peculiarity.

For the classification of slides this system is not only peculiarly applicable, but incomparable; in addition to the great and decisive advantage of having the slides bear the same index numbers as the corresponding literature. In fact the whole scope and utility of the system only become obvious when the same numbers are applied, and serve as a clue, not only to books, pamphlets, clippings and slides, but likewise to the related notes, lecture MSS., diagrams, lantern slides, and illustrative specimens or aids of various kinds; a utilization which the writer and others have employed with facility and

satisfaction for many years. For accurately locating the definite points shown in slides, or discussed in fragmentary notes, a subdivision on the Dewey lines but far beyond the Dewey limits is required; and the full tables used by the writer for this purpose will probably be published elsewhere. The following key and synopsis show the plan of the whole and will be of use for every worker with the microscope.*

*Persons desiring the whole Dewey system can obtain it in book form from the Library Bureau, Chicago, Ill., or Boston, Mass.

Special elaborations of Zoology, and of Anatomy and Physiology, which are particularly valuable for microscopical purposes, can be obtained in pamphlet form from the Concilium Bibliographicum, Zürich, Switzerland, as follows:

Tables for use in zoological bibliography..... .....Franc 0.50
" " " physiological " ..... " 1.30
Prospectus of zoological section (English edition).... " 2.00

Library cards on recent publications in Evolution, Microscopy, Paleontology, Zoology, Anatomy, Physiology at 1 to 5 francs per hundred (exact prices are given in Prospectus q. v.).

An interesting pamphlet in French on the decimal classification and its aim, with general abridged tables, is issued as Publication No. 9, by the Office International de Bibliographie, 1, rue du Musée, Bruxelles, Belgium.

INDEXING AND CLASSIFICATION IN MICROSCOPY
By The Decimal System

Classes of the Decimal System
Dewey's

0 General		
1 Philosophy	4 Philology	7 Fine Arts
2 Religion	5 Natural Science	8 Literature
3 Sociology	6 Useful Arts	9 History

General Section of Microscopy
Dewey's

578 Microscopy
- .1 Varieties of Microscopes
- .2 Optical Parts
- .3 Mechanical Parts
- .4 Accessory Apparatus and Management of Microscope
- .5 Illuminating Apparatus
- .6 Preparation and Mounting of Apparatus
- .7 Special Preparation and Study of Inorganic Material
- .8 " " " " " Botanical Material
- .9 " " " " " Zoological Material

Key to the Amplified Method in Microscopy
As developed in the annexed Synopsis of Classification

5 Natural Science
57 Biology
578 Microscopy
578.1 Apparatus
578.4 Accessories
578.42 Micrometry
578.429 Standards
578:5 The Microscope in Science
:55 In Geology
:552 Micro-Petrography
:552.2 Volcanic rocks

:552.22 Volcanic ashes, etc.
:6 Economic Microscopy
:61 The Microscope in Medicine (In broadest sense)
:614 In Sanitation
:614.3 Study of Adulterations, etc.
:614.32 Milk and its Products
:614.325 Butter and its Imitations

Ex., Discussion of the Am. Mic. Soc.'s standard cm. is	578.429
Verified copies of its rulings, on glass or metal slides,	.429
A drawer of Rock sections, or any literature concerning them,	:552
Oleomargarine specimens, or related literature,	:614.325
In using full tables the last item would have an adjacent number of its own,	:614.326

In this system everything is a subdivision of the branch from which it directly springs, 578.04, for instance, being one of the ten possible branches of 578.0; and everything should be classified in the most definite group that will hold it. Ex., (See under Synopsis of Classification), a paper on Microscopy is 578.04; on Microscopical societies, 578.0604; on Slide-cabinets, 578.074; on Teaching microscopy, 578.077; on Microscopical history, 578.0904; on Microscopes, 578.104; on Illumination of projecting microscopes, 578.125; on Uses of the microscope, :604. In all these cases the ".0" or ".04", which are here used freely to show the method of distribution and of subdivision when required, may well be omitted in small collections, as is here done in the instance before the last, and added afterward when the accumulation of material becomes troublesome and requires further sifting.

The analysis given in the following "Synopsis of Classification" is offered as a bird's-eye view of the various fields of microscopical study; to present, especially to the non-professional microscopist, the wide scope of the specialty, and to suggest its many inviting fields for research. It is given in

the terms and methods of the decimal system of classification, which has not hitherto been publicly adapted to the special use of microscopists, so far as the writer is aware, to show the utility of the system in microscopy, notwithstanding the too general impression that it is difficult and impracticable; and as an aid to its use by microscopists who are not bibliographers, in the utilization of slides and literature, including fragmentary notes, clippings and cross references.

With a very strong impression of the advantages of uniformity in such work, and of the inconveniences of changing, for however good reasons, figures already used to any considerable extent, the writer has retained as far as possible not only the "Dewey" figures but those of the Brussels and Zürich amplifications, even where it is evidently done, in respect of both theory and practice, at a considerable sacrifice on account of their having been prepared without special provision for the exigencies of microscopy.

Whenever any usage is employed or suggested that differs from the accepted teachings and practice of (public) library economy, it is obviously not for the sake of controversy or even questioning such practice, but to give the writer's preference for a different usage in the case of private owners, especially microscopists, when handling their own material.

As here presented, the subjects pertaining to Apparatus and Technique are found in 578.1–.6, while all of Applied Microscopy is given in a ":" series, in the order of the principal classification.

The subdivision of :5 could be given in 578.7–.9, and can be distributed there by anyone who prefers, as explained in the notes to 578.7, .8 and .9. But circumstances have wholly changed since Section 578 was written and published. The conditions now to be met did not then exist, the microscopy of the present has been created since that time, and its needs were then undreamed of as well as unknown. The subdivision, excessive perhaps for other present purposes, that is required to make the decimal system available for it at all, seems to be best accomplished after the ":". Still more is this true of the

:6 series, which could not be forced into 578 otherwise, with even tolerable satisfaction. The following advantages are secured by the arrangement here given. 1. It is most simple and readily understood by the unfamiliar. 2. Everything is directly interchangeable with any decimal service, without any complications. To draw from any "Dewey" library, personal or public, it is only necessary to disregard the ":", as by taking 581.3 when :581.3 is here indicated, and prefixing the ":" if the article is to be permanently assigned here; and, conversely, to transfer from here to the general library, disregard, or for permanent change remove, the ":" from before the section number. 3. In many of the more important groups where subdivision must be carried to a maximum number of digits, from two to three digits are here saved, which, other things being equal, is a decisive advantage.

For literature, the "578" should always be written before the "."; while in a private microscopical library it may be understood, not expressed before ":" which naturally refers to its owner's specialty. It need never be used on a microscopical slide, whose sectional character is obvious; but the characteristic "." and ":" should be carefully retained for maintaining the familiar appearance of the figures as a part of the decimal system. For ease of reading, and prevention of mistakes, the writer prefers keeping the "." invariably in the original Dewey position, after the third figure of the line of principal classification, and likewise marking the third point thereafter, when the line extends beyond that, by a comma as ordinarily used in writing and printing figures.

Paleontology is well provided for in the D. C. :56. But many microscopists, botanists or zoologists, who are not also geologists, have a few specimens of fossils, or corresponding notes which can best be incorporated in their own subjects. These can be distributed in :58 and :59, for instance; as putting sections of fossil wood in :581.4 or :581.8, and fossil ferns in :585.1. But it is often preferred to avoid this scattering of the fossils, and they are often found mixed with the rock sections.

To meet this want, the writer has ventured to propose an amplification of 581.9 and 591.9 which does not conflict with any D. C. use, and fortunately coincides exactly with the Brussels scheme of place-subdivisions, though the writer used it publicly in botanic teaching and lectures at least ten or fifteen years before the Brussels Institute was founded. This arrangement brings fossils in the slide-cabinet, very conveniently, immediately after histology; and also provides usefully, for our purpose, for physiographic arrangement in .92.

In Micro-Botany, the writer's amplification of :581 is given to the extent deemed necessary for the present purpose; and in Systematic Botany, :582–9, his indexing is given to the large groups sufficient for a rough preliminary classification, on the new philosophical order as adopted by Britton and Brown. The writer's amplification of the whole of Botany, strictly on the D. C. lines, which he has used on trial for several years, is too large for incorporation here, and will probably be published elsewhere.

Medical Jurisprudence, which lawyers would naturally classify in :340.6, is to most microscopists and physicians not a branch of Sociology but of physical and applied science, naturally of :61, and it is therefore here located in :614.23 where mentioned in D. C.

Microscopical Jurisprudence, a new title, is equally a matter of Economic Microscopy, :6. It is not a branch of Medicine, though closely related to it. As there seems to be no D. C. group that can include it to advantage, nor any unassigned index number in :6, it is here indexed :6j, and placed next to :61 where it belongs. The writer's elaboration of this topic is given in the tables.

It can hardly be necessary to remind beginners that any part of the decimal system which they happen to neither want nor try to use can do them no harm by its alleged complexity or its long figures; and if they should grow into it, by using a few primary groups at first, and then subdividing these at their own convenience and no farther, they would find it easy, and could

hardly fail to acquire, meanwhile, a better command of what they have and know, and a clearer conception as to what they want to have and to know. A beginner's collection might well be sorted into six groups, indexed

578.1 Apparatus and its Technique
578.6 Preparation and Mounting
:5i Scientific studies, Inorganic
:58 " " Botanic
:59 " " Zoologic
:6 Economic Microscopy

To which physicians would naturally add

:61 Medical Microscopy.

When any group becomes inconveniently large it would be divided by reference to the synopsis hereafter given, or to fuller tables. When, much later, the need arises for larger figures to specify higher subdivisions, they will be welcomed instead of dreaded.

SUMMARY OF MICROSCOPY

Arranged by the Decimal System

For permanent use with very small collections, or as an easy beginning with larger. Any or all parts can be readily amplified at any time, while in use, by adding to the objects further figures from the Synopsis following.

See key and explanatory notes on preceding pages.

Note series of ":" following series of ".".

578 MICROSCOPY

General or Mixed Works unclassifiable below

.05 Periodicals

.06 Societies

578.1 Apparatus and its Technique

.11 **Microscopes**

.4 Accessories and their Use

.5 Illuminating Apparatus

578.6 Preparation and Mounting of Objects

578:5 The Microscope in Science

Inorganic Microscopy

:54 Micro-Chemistry

:549 Micro-Mineralogy

:58 Micro-Botany

Unclassifiable, arranged alphabetically here

:581 Physiological and Structural

.4 Anatomy and Histology of Members

.8 Histology

:582 Study of Cryptogams (Spore-Plants)

:583 Thallophytes

.1 Algae; .2, Fungi; .3, Bacteriology; .9, Lichens

:584 Bryophytes

.1 Liverworts; .5, Mosses

:585 Pteridophytes

.1 Ferns; .2, Water Ferns; 3, Equisetums; .4, Club Mosses

ADDITIONS AND CORRECTIONS

The following indispensable amplifications of :583.1–.2 of p. 161, and of :583.6–.9 and :585.1 and :587 of p. 164, and the accompanying minor corrections, failed to appear in the publication on account of the impossibility of the author's seeing the proofs at the proper time.

CORRECTIONS.

P. 148 Insert ":5i" before "Inorganic Microscopy."

149 Under line ":591" insert ".1 Physiology: .2 Pathology, comparative; .3 Embryology."

After ":591.4 Anatomy" add "and Histology of Organs."

Under ".477" insert ".478."

154 After ":58 Micro-Botany" add "This amplification of Micro-Botany is also intended for **GENERAL BOTANY**, by omitting the "578:": and it has thus been used by the author for several years. Ex., Climbing plants, 581.54; Osmundiaceae (in modern classification) 585.14."

Line ":016" and the following line should be placed above ":58 General."

156 After " 43 Shoot" add ":439 Bud."

157 Line ".49", bring "Trichomes" into alignment with "Flower" and "Fruit."

Line ".52." add "Cf. :581.926 and .928

158 .811.2, read "Cytoplasm."

159 .871, for "Mostly to" read "Cf."

161 .93-9, after "( )" insert "See table, pp. 174-6."

:583.1 and .2, see amplification on p. 1 of the additions.

164 :583.6-.9, :585 and :587, " " 2 "

Note to :59, for "are those" *et seq.*, read "are with few exceptions from the Zürich amplification."

176 (866), read "Ecuador."

NOTE.

To be inserted in article "Library Expedients in Microscopy" by R. H. Ward in Trans. Amer. Micros. Society, Vol. 21, p. 127-176.

The additions are printed so that they can be cut apart and inserted at the proper page if desired.

578:586 Study of Phanerogams (Seed-Plants)
Spermatophytes
:587 Gymnosperms
:588 Monocots
:589 Dicots

:59 Micro-Zoology

General
:591 Physiological and Structural
.4 Anatomy
.477 Integument
1, Hairs; 5, Scales, Exoskeleton; 6, Nails; 7, Feathers; 8, Horns
.8 Histology
1, The Cell; 2, Connective Tissue; 3, Cartilage; 4, Bone; 5, Blood, Lymph; 6, Muscle; 7, Epithelium; 8, Nervous Tissue
:592 Invertebrates
:596 Vertebrates
:597 Fishes
.6 Amphibians
:598.1 Reptiles
.2 Birds
:599 Mammals

578:6 The Microscope in Useful Arts

:6j The Microscope in Law [Microscopical Jurisprudence]

:61 The Microscope in Medicine [Medical Microscopy]

General
:611 Human Anatomy and Histology
.018 Histology
1, The Cell; 2, Connective Tissue; 3, Cartilage; 4, Bone; 5, Blood; 6, Muscle; 7, Epithelium; 8, Nervous System
:612 The Microscope in Physiology
:614.3 Adulterations, etc.
:616 Diseases. Pathology
.96 Parasites
:617 Surgery

:62-9 The Microscope in other Useful Arts

SYNOPSIS OF CLASSIFICATION.

For use in arranging microscopical libraries or slide-collections, or as a clue to the more complete tables required by experts. Also as an index to the literature related to microscopy in all libraries, and to the exact numbers where it may be found in those classified on the decimal system.

See key and explanatory notes on preceding pages.

Note series of ":" following series of ".".

578 MICROSCOPY

:016 General Bibliography of Microscopy

General or Mixed Works unclassifiable below, arranged here, A–Z

578.01 Philosophy. Theories

.02 Compends. Treatises

.03 Dictionaries, etc.

.04 Essays, Addresses, Letters, Separates, Reviews

.05 Periodicals. Annuals

.06 Societies and their Proceedings.

Their Journals, etc., to .05

.061 Official Institutions

.062 Scientific, Professional or Social Associations, Clubs, Sections, etc.

1, Transactions; 2, Meetings, Reports; 3, Organization; 4, Membership; 6, Exhibitions, competitions, prizes, etc.; 7, Festivities, excursions, field meetings; 8, Other society enterprises, house, rooms, libraries, cabinets instruments, research and work

.063 Congresses

.064 Expositions

.07 Educational

.072 Laboratories, Experiment Stations, etc.

.074 Museums. Cabinets

.076 Gardens. Aquaria

.077 Teaching

578.078 Apparatus, Models, Lecture Charts and Diagrams, Lantern Slides and Illustrative Specimens

.08 Collective Works. Miscellanies

.09 History of Microscopy

Ex., of German Microscopy, 578.0943

.091 Travels, etc., related to Microscopy

.092 Biographies and Addresses of Microscopists

Some would arrrange these with the History, by countries, in .09

See also Biologists, :570.92; Botanists, :580.92; Zoologists, :590.92

578.1 Apparatus and its Technique

.11 Varieties of Microscopes

.12 Projection

2, Lenses; 3, Stand; 4, Accessories; 5, Illumination

.13 Simple. Preparing

2, Lenses; 3, Stand; 4, Accessories; 5, Illumination

.14 Compound

.2 Special Parts, Optical

2, Reflectors; 3, Objectives, theory, definition, power, nomenclature; 4, Aperture; 5, Immersion; 6, Aberration and Correction; 7, Testing, test objects, micro-ruling and writing; 8, Oculars; 9, Powers of compound microscope

.3 Mechanical. Stands

1, Body; 2, Stage; 3, Substage; 4, Limb; 5, Base; 6, Tail-piece; 7, Coarse adjustment; 8, Fine adjustment; 9, Special stands

.4 Accessories and Use

.41 Drawing

.42 Micrometry

.43 Goniometry

.44 Polariscope

578.45 Spectroscope
.46 Erectors
.47 Minor Accessories
.48 Tables, Cases, Outfit
.49 Photomicrography
.499 Microphotography
.5 Illuminating Apparatus
1, Sources of light; 2, Opaque ill.; 3, Dark field; 4, Transparent; 5, Reflectors; 6, Condensers; 8, Special oblique; 9, Binoc ular

578.6 Preparation, Mounting, etc., of Objects

.61 Collection and rough preservation
.62 Examination. Methods, interpretation, errors
.63 Special Treatment
.631 Laboratory, table, apparatus, supplies
.635 Mechanical processes
.636 Treatment of suspended matters, deposits, etc.
.637 Fixing, hardening, softening, etc.
.64 Dissection
.65 Bleaching, staining, clearing
.66 Injection
.67 Section cutting
2, Infiltration; 3, Imbedding; 4, Freezing; 5, Cutting, microtomes, serial sections; 8, Treatment of sections; 9, Hard sections
.68 Mounting
.681 Apparatus, etc.
.684 Manipulation. Arrangement
.686 Dry Mounting
.687 Other media
.688 Finishing. Cements, Varnishes
.689 Repairing
.69 Reconstruction from sections, Models, etc.
578.7 (Special Preparation and Study; Inorganic)
Inorganic Microscopy can conveniently be located here, instead of in :5, if intended to be a very small and subordi-

nate department; any required items from :5 to :55 being inserted here by changing :5 to 578.7, or conversely being transferred from here to there by changing 578.7 to :5. See note to :5

578.8 (Special Preparation and Study; Botanic)
Micro-Botany can be located here if desired, transferring any or all of :58, below, by changing :58 to 578.8, or conversely transferred from here to there by changing 578.8 to :58. See note to :5

578.9 (Special Preparation and Study; Zoologic)
Micro-Zoology; same note as to 578.8, above, reading :59 for :58, and .9 for .8. See note to :5

:34 The Microscope in Law; see :6j

578:5 The Microscope in Science

(Special Preparation, Study and Description)
See explanatory notes following the "Key to the Method"

:5i Inorganic Microscopy

:54 Micro-Chemistry

:546 Inorganic Chemicals. 1, Non-metallic; 2, Metallic

:547 Organic Chemicals

:548 Crystallography

:549 Micro-Mineralogy

:55 Micro-Geology

:552 Micro-Petrography
.2, Volcanic rocks; .22, Volcanic ashes, etc.; .3, Plutonic; .4, Metamorphic; .5, Sedimentary; .6, Meteorites; .7, Decay of rocks

:553 Economic Geology
.2, Carbon series, peat, coal, fossil resins, etc.; .3, Iron ores; .4, Other ores; .6, Earthy economic minerals; .7, Mineral water deposits; .8, Gems

:56 Micro-Paleontology
See notes after "Key to the Method"

:561 Fossil Plants
Here, or, for small collections, to :58

:562 Fossil Invertebrates
Here, or, for small collections, to :59

578:566 Fossil Vertebrates
Here, or, for small collections, to :59

:57 Micro-Biology
Mostly to :58 and :59

:58 Micro-Botany
See notes after "Key to the Method"

:58 General
:580.1, Philosophy, Nomenclature; .2, Compends, Treatises; .3, Dictionaries, etc.; .4, Essays, Addresses, etc.; .5, Periodicals; .6, Societies; .7, Study and Teaching; .72, Laboratories, Experiment stations; .73, Bacteriology, to :583.3; .74, Museums, Herbarium work; .76, Botanic gardens, Aquaria; .77, Teaching, Pedagogy; .78, Apparatus, etc., of instruction; .8, Collective works, Miscellanies; .9, Botanic History; .91, Travels related to Botany; .92, Biographies of Botanists

:016 Bibliography
Unclassifiable, arranged here A–Z

:581 Physiological and Structural
.1 Physiology
.11 Nutrition
.111 Plant Constituents and Food
.112 Absorption and Conduction
.112,9 Movements of Gases
.113 Transpiration
.114 Photosynthesis; 9, Metabolism
.115 External influences
.116 Special processes. Cf. Ecology, :581.5
.117 Saprophytes. 8, Parasites. 9, Insectivoræ. 95, Symbionts
.12 Respiration. 1, Temperature; 2, Phosphorescence
.123 Products

578:581.124 Distribution. 5, Storage. 6, Utilization. 69, Waste
.127 Growth
.128 Periodicity
.129 Development of Members
5, Adventitious growths; 8, Wounds and Repair; 9, Grafting, cf. :634
.13 Movements
1, Stability; 3, Elasticity; 5, Turgidity; 7, Tensions
.139 Mechanical tissues
.14 Curvature movements
.141 Hygroscopic curvatures
.142 Growth curvatures
.143 Nutation. 4, Heliotropism. 5, Hydrotropism. 6, Geotropism
.147 "Orthotropism". 8, Coiling
.15 Motions of Organs
1, Sensitive plants; 2, Insectivoræ; 5, Gyrations; 7, Sleep of plants
.159 Locomotion. Cf. Cytology, :581.81
.16 Reproduction
1, Individuality; 2, Longevity; 3, Death; 4, Permanence of Protoplasm. Cf. :581.81
.166 Vegetative Propagation
.168 Budding. 9, Spore formation
.17 Sexual Reproduction
1, Differentiation of sex; 2, Alternation of generations
.173 Parthenogenesis
.175 Fertilization
.176 Pollination. 7, Cross fertilization. 8, Hybridization
.18 Reproduction of Thallophytes
.181 Conjugation
.182 Oophytic

578:581.183 Carpophytic
.185 Of Archegoniatae
.186 Bryophytes and Pteridophytes
.187 Antherozoids
.188 Egg cells
.189 Gymnosperms
.19 Of Siphonogamae
.191 Pollen plants
.2 Pathology
.22 Teratology
.3 Embryology. Ontology
.31 Ovule
.32 Fertilization
.33 Embryo
.34 Development. Histology
.35 Morphology
.36 Vitality
5, Longevity; 9, Continuity of embryonic substance
.37 Germination
1, Time; 2, Conditions; 3, Effects
.38 Seedling
.39 Ontological development
.4 Morphology, Anatomy [and Histology of Members]
Cf. Histology, :581.8. Care is required to avoid maintaining duplicate series here and there. All histology that is separable should go there, unless a non-botanist having a few sections, etc., that show distribution of tissues (:581.85–.89) should prefer to employ the simpler and easier classification here, for all.
.41 Thallus
.42 Root
.43 Shoot
.44 Stem
.449 Branching
.45 Leaf

578:581.46 Flower
.463 Perianth
.464 Calyx
.465 Corolla
.466 Stamens
.467 Pollen
.468 Pistils
.47 Fruit
.48 Seed
.49 Trichomes. Emergences, etc.
.5 Habits. Ecology
.51 Climate-relations
.52 Aquatics, etc.
.53 Drouth Plants
.535 Salt-region Plants
.54 Climbing Plants
.549 Epiphytes
.55 Saprophytes
.56 Parasites, etc.
.57 Carnivorous Plants
.58 Symbionts
.59 Protective Adaptations
.6 Economic Botany
.61 Food-stuffs
.62 Food-adjuncts
.63 Medicinal Plants

For general students, here; for medical, to :615

.64 Oils, Waxes, etc.
.645 Gums, Resins, etc.
.648 Dyes, etc.
.65 Tanning Materials
.655 Fibers, etc. Cf. Manufactures, :67
.66 Wood. Cf. Forestry, :634.9
.669 Barks
.67 Fodder Plants, etc.

578:581.68 Other Products from,
1, Thallus, Cryptogams; 2, Root, tuber, etc.; 3, Shoot; 4, Stem; 5, Leaf; 6, Flower; 7, Fruit; 8, Seed; 9, Hairs, etc.

.69 Injurious Plants. Mostly distributed elsewhere

.8 Histology

.81 The Cell. Cytology

.811 Protoplasm (Energid)
1, Nucleus; 2, Cyptoplasm; 5, Plastids; 8, Continuity of protoplasm; 9, Cell nutrition and growth

.812 Cell Wall and Morphology

.812,5 Forms

.813 Thickenings, etc.
2, Collenchyma; 3, Sclerenchyma; 4, Tracheids; 6, Irregularities, 7, external, 8, internal, pits, reticulations, rings, spirals, etc.; 9, Cystoliths

.814 Transformations

.815 Non-nitrogenous products and contents
1, Starch; 2, Inulin; 5, Caoutchouc; 7, Oils; 8, Resins; 9, Crystals, etc.

.816 Nitrogenous products and contents

.816,5 Crystalloids

.817 Cell Movements
1, Irritation; 2, Streaming; 3, Rotation; 5, Creeping; 6, Cilia; 7, Flagella

.818 Cell Formation. Reproduction
1, Nuclear division, karyokinesis; 3, Cell-division; 4, Free cell-formation; 5, Cell-budding; 6, Conjugation

.819 Age and Death of the Cell

.82 Cell Families (Cohesions)

.821 Cell Fusions

.822 Fertilization. 3, Plasmodium. 4, Hyphae. 5, Sieve-tubes. 6, Latex-tubes. 7, Vessels

578:581.83 Tissues and Tissue Systems
.831 Cell-building. 6, Cell-connection. 7, Spurious tissues
.838 Meristem
.839 Fundamental tissue
.84 Tegmentary system
.841 Epidermis. 1, Incrustations; 2, Exudations, secretions; 4, Coloration; 5, Stomata; 6, Water-pores; 7, Trichomes, Emergences, Glands, etc.
.843 Vascular Bundle system
.844 Distinct bundles. Phloem, Xylem
.847 Conjoint bundles. Concentric, Collateral, Closed, Open
.85 Distribution of Tissues
.851 Ontogeny and Phylogeny
.855 In Thallophytes
.856 Bryophytes
.857 Pteridophytes
.858 Phanerogams
.859 Embryo
.86 Root
.861 Epidermis, hairs, cap, sheath
.864 Primary cortex, exodermis, endodermis
.866 Central cylinder, pericycle, vascular strands
.869 Medullary tissue
.87 Stem
.871 Epidermis. Mostly to :581.841
.872 Primary cortex
.873 Hypoderma, fundamental tissue, endodermis
.874 Primary central cylinder
.875 Pericycle
.876 Vascular bundles. Phloem Cambium, Xylem

578:581.877 Bundle sheath, Bundle-strands, Medullary sheath
.878 Medulla (pith). 9, Medullary rays
.88 Secondary tissues
.881 Secondary growing points and meristem
.881,2 Adventitious growths
.882 In Monocots
.883 Fundamental tissue
.884 Scattered vascular bundles
.885 Cambium ring
.886 Gymnosperms and Dicots
1, Leaf bundles; 2, Cauline
.887 Bast
1, Cortical rays; 2, Periderm; 3, Cork; 4, Bark; 5, Lenticels; 6, Leaf-scars; 7, wound-cork, etc.
.888 Cambium
.889 Wood
.889,1 Seasonal growth. Annual rings
.889,3 Sap wood. 4, Heart wood
.889,5 Medullary rays
.889,6 Coloration
.889,7 In Gymnosperms
.889,8 Anomalous thickenings
.889,9 Knotted, curled, etc.
.89 Leaf
·891 Epidermis. Mostly to :581.841
.892 Fundamental tissue
.893 Leaf bundles
.894 Flower
.895 Perianth. 6, Stamens. 7, Pistils,
.898 Fruit. 5, Seed
.899 Trichomes. Emergences. Glands

:583.1 Algae

.11 Cyanophyceae (Blue-green Algae)

.12 Chlorophyceae (Green Algae)

.13 Protococcales

.14 Siphonales

.15 Conjugatales

.153 Desmidiaceae

.154 Diatomaceae

A good arrangement for diatoms in a slide-cabinet, would be:—(*a*) Special preparations showing methods or results of mounting, etc. (*b*) Opaque mounts, and those *in situ* in deep cells. (*c*) Specially selected and verified test objects. (*d*) Named Genera, alphabetically, or classified according to Prof. C. E. Bessey's paper in same Vol. (Proc. Am. Mic. Soc. 1899). (*e*) Unnamed or mixed mounts, ( ), see pp. 174–6.—Ex., Strewn diatoms from Hawaii, :583.154(969). The index No. of diatoms, :583.154, should be written on the drawers containing them, but is needless on the slides whose character is obvious. When the drawers are numerous they may be marked *a*, *b*, *c*, *d*, ( ), etc., for the groups above named or for others desired. The slides may be marked with a fine pen in red ink with the same group letters, also underlining in red the first letters of the genus in group *d* for alphabetic arrangement, and giving the geographic index complete in group *e*, as (969).

.16 Confervoidales

.17 Phaeophyceae (Olive-brown Algae)

.18 Rhodophyceae (Red Algae)

.189 Corallinaceae

.2 Fungi

.21 Myxomycetes (Slime Fungi)

.3 Schizomycetes (Fission Fungi. Bacteria)

(As given in the Synopsis, pp. 161–4)

578:581.9 Distribution of Plants
.91 Geologic (Phytogeology). cf. Paleontology, :561
Div. like :581.4, or like :582-9
.92 Physiographic. ( )
See Table of Geographic Subdivisions
.93 Geographic (Phytogeography)
.930,1 Principles. Theories
.930,11 Local conditions. Moisture, temperature, soil
.930,12 Zones of Latitude and Altitude
.930,15 Distribution. By winds, streams, animals, man
.930,16 Limitations. Mountains, deserts, oceans
.930,17 Insular. 18, Polar
.930,19 Regions of Vegetation
.93-9 Floras, etc. ( )
Ex., Plants of Florida, :581.9(759)

:582 Study of Cryptogams (Spore-Plants)
The index numbers here given in the systematic classification are adapted to the philosophical arrangement, corresponding to that universally employed in zoology, which did not exist when the Dewey system was published. Britton and Brown's Ill. Flora of the Northern United States, etc., is taken as a standard for the order, so far as it goes. Those preferring the former classification can of course obtain it from the Dewey books.

:583 Thallophytes
.1 Algae
.2 Fungi
.3 Bacteriology
This analysis is not intended for those professional bacteriologists who may prefer to classify with regard to their own work or their latest theories; but it is offered as a practical scheme for the

convenience of others in arranging their literature, references and specimens.

Bacteriology is here given as a whole, on the D. C. methods but with original numbering. Medical specialists can, if preferred, readily transfer the whole, or only the Medical Bacteriology, .53-.59, to :610.73.

578:583.3:016 Bibliography

.307 Technique

3, Staining; 5, Cultures; 7, Sterilization; 9, Photomicrography, cf. 578.49

.31 Physiologic Bacteriology

.311 Identification. Pseudo-Bacteria

.32 Cytology, etc.

.33 Association

Chains, filaments, swarms, zoogloea, mycoderma, precipitate-condition

.34 Origin; 5, Dissemination

.35 Reproduction

1, Fission; 5, Spores; 8, Variation; 9, Polymorphism

.36 Nutrition. 1, Aliments

.37 Conditions; 9, Luminosity

.38 Products

.389 Movements

.39 Effects of physical agents

.4 Systematic Bacteriology

.41 Micrococci (Spherobacteria)

.42 Chromogenic species

.43 Zymogenic species

.44 "Monads"

Pathogenic species, to Medical Bact., :583.53, unless preferred to keep all in one series

.45 Bacilli (Rod-like forms)

.46 Spirillae (Spirobacteria)

.5 Economic Bacteriology

.51 Bacteria in Fermentation. Cf. :583.38 and :663

578:583.52 Bacteria in Putrefaction. Cf. :583.38
.529 Nitrification. Cf. :581.111 and :583.546
.53 Bacteria in Medicine. Medical Bacteriology
.530,7 Experiments on animals. Vivisection
.531 Infection. Susceptibility. Immunity
.537 Pathogenic Micrococci
.538 Pathogenic Bacilli
.539 Pathogenic Spirillae

The last three divisions are for general discussions only, or for the arrangement of very small collections. The following subdivisions are for more extensive work.

.54 Bacteria in Hygiene and Sanitation. Cf. :614
.541 In Air
.542 Of various places
.543 Of various employments
.544 On clothing, etc.
.545 On surface of the body
.546 In the Soil. Cf. :581.111 and :583.529
.547 In Food
.548 In Drinks
.549 In the stomach and intestines. Cf. .563
.55 Bacteria in Pharmacy
.555 Antiseptics, Disinfectants, etc.
.56 Bacteria in Disease. Cf. :616
.561 Of Circulatory system
.562 Respiratory system
.563 Digestive system
.564 Lymphatic system
.565 The Skin. Dermatology
.566 Genito-Urinary system
.567 Organs of Locomotion
.568 Nervous system
.569 General Diseases

Cf. and div. like :616.9 if required

578:583.57 Bacteria in Surgery
.572 Suppuration. Tetanus
.576 In Dentistry. The Teeth
.577 Ophthalmology. The Eye
.578 The Ear
.579 Military Surgery
.58 Bacteria in Gynecology
.582 Obstetrics
.59 Bacteria in Comparative Medicine
Cf. and div. like :619
.9 Lichens
:584 Bryophytes
.1 Liverworts
.5 Mosses
:585 Pteridophytes
.1 Ferns
.2 Water Ferns
.3 Equisetums
.4 Club Mosses
:586 Study of Phanerogams (Seed-Plants)
Spermatophytes
:587 Gymnosperms
:588 Monocots
:589 Dicots
.1 Choripetalae, "Apetalae"
.2 " "Polypetalae"
.7 Sympetalae, Gamopetalae

:59 Micro-Zoology

The figures throughout Zoology, :59, when in excess of the D. C., are those of the Zürich amplification, except .91

General

:590.1, Philosophy, Nomenclature; .2, Compends, Treatises; .3, Dictionaries, etc.; .4, Essays, Addresses, etc.; .5, Periodicals; .6, Societies; .7, Study and Teaching; .72, Lab-

:583.6 Phycomycetes (Algal Fungi)
.61 Oomycetes
.66 Zygomycetes (Mould Fungi)
.7 Ascomycetes
.71 Hemiasci
.72 Exoasci
.73 Carpoasci
.74 Cleistomycetes
.77 Pyrenomycetes
.79 Discomycetes
Ascolichenes to .97
.8 Basidiomycetes
.81 Hemibasidia (Brand Fungi)
.84 Basidiomycetes
.88 Hymenomycetes
.89 Gasteromycetes
Basidiolichenes to .98
.9 Lichens
.97 Ascolichenes. Div. like .7
.98 Basidiolichenes. Div. like .8
:585.1 Filicinae (True Ferns)
.11 Ophioglossaceae
.12 Marattiaceae
.13 Isoetaceae (Quillworts)
.14 Osmundiaceae
.15 Gleicheniaceae
.16 Hymenophyllaceae
.17 Schizaeaceae
.18 Cyatheaceae
.19 Polypodiaceae
:587 Gymnosperms
.1 Cycadales
.2 Ginkgoales
.3 Coniferae
.4 Taxaceae
.41 Podocarpeae
.49 Taxeae
.5 Pinaceae
.51 Araucarineae
.6 Abietineae
.7 Taxodineae
.8 Cupressineae
.9 Gnetales

oratories, Experiment stations, Dissection, Vivisection; .73, Bacteriology, to :583.3; .74, Museums; .76, Zoologic Gardens, Aquaria; .77, Teaching, Pedagogy; .78, Apparatus, etc., of instruction; .8, Collective works, Miscellanies; .9, Zoologic history; .91, Travels related to Zoology; .02, Biographies of Zoologists

578:591 Physiological and Structural
- .1 Physiology
- .2 Pathology
- .3 Embryology
- .4 Anatomy [and Histology of Organs]
  - .41 Circulatory Organs
  - .42 Respiratory Organs
  - .43 Nutritive Organs
  - .44 Lymphatic System
  - .46 Genito-Urinary Organs
  - .47 Motor Organs
    - .477 Integument
      - .478,1 Hairs
      - .478,5 Scales, Exoskeleton
      - .478,6 Nails
      - .478,7 Feathers
      - .478,8 Horns
  - .48 Nervous System
  - .49 Somatology
- .5 Habits of Animals. Ecology
- .6 Economic Zoology
- .8 Histology
  - .81 The Cell. Cytology
  - .82 Connective Tissue
  - .83 Cartilage
  - .84 Bone
  - .85 Blood. Lymph
  - .86 Muscle

578:591.87 Epithelium
.88 Nervous Tissue
.9 Distribution of Animals
.91 Geologic
.92 Physiographic
.93-9 Geographic
:592 Invertebrates
:593.1 Protozoans
.2 Radiates
.3 Coelenterates
.4 Sponges
.5 Cnidaria
.6 Actinozoa
.7 Hydrozoa
.8 Ctenophora
.9 Echinoderms
:594 Molluscs
.1 Bivalves
.2 Scaphopods
.3 Gastropods
.4 Pteropods
.5 Cephalopods
.7 Polyzoa
.8 Brachiopods
.9 Tunicates
:595 Articulates
.1 Worms
.11 Parasites
.14 Annelids
.18 Rotifers
.2 Arthropods
.3 Crustaceans
·31 Entomostracans
.35 Cirripedia
.36 Malacostraca
.4 Arachnidans
.6 Myriopods

578:595.7 Insects
1, Thysanura; 2, Orthoptera; 3, Pseudo-Neuroptera; 4, Neuroptera; 5, Hemiptera; 6, Coleoptera; 7, Diptera; 8, Lepidoptera; 9, Hymenoptera

:596 Vertebrates
:597 Fishes
:597.6 Amphibians
:598.1 Reptiles
.2 Birds
:599 Mammals. Human, mostly to :61

578:6 The Microscope in Useful Arts

[Economic Microscopy]
Cf. 581.6 and 591.6

General. Div. like 578.01–.09

:6j The Microscope in Law

[Microscopical Jurisprudence]
Cf. Medical Microscopy, :61, especially Medical Jurisprudence, :614.23

:6j1 Courts; 3, Laws; 5, Evidence; 9, Fees
:6j2 Identification of Persons
Handwriting, Chirography, to :6j3
.1 Skin. 2, Hair. 3, Finger marks. 4, Clothing, etc.
.5 Blood stains. Identification, kinds
.8 Other stains
:6j3 Handwriting. Chirography
.1 Special Instruments and Technique
.2 Personal characteristics from
.21 Character of fingers or hand. Anatomical, pathological
.22 Temperament. .23, Tremor
.24 Habit. .25, Signature
.26 Position. Style
.27 Pen pressure. Shading
.28 Character and details of letters and words

578:6j3.29 Effects of excitement, fatigue, disease, age
.3 Disguised writing
.4 Pen characteristics
.5 Pencil characteristics
.6 Ink characteristics. Kinds, age, treatment
.7 Paper characteristics. Fibers, color, age, treatment
.8 Falsification. Forgery
1, Alterations
2, Additions; 4, Superposition; 6, Erasures; 8, Bleaching
.9 Imitative writing
.91 Tracing
.92 Mechanical effects; furrows, fibers
.93 Pencil marks; covered, uncovered, rubbed
.95 Off hand
:6j4 Counterfeiting. Cf. :76
:6j7 Sexual cases
1, Seminal stains; .2, Menstrual stains
.4 Impotence. .5, Sterility
.6 Divorce
.7 Rape
.8 Pregnancy. .9, Abortion
:6j8 Civil cases
Cases of actual or impending litigation, involving questions of identification or comparison, adulteration or falsification, qualities or values, age or wear, or other pecuniary interests, are often capable of receiving aid from the microscope
See Disputed writing, :6j3; Foods and beverages, :614.3; Hygiene and nuisances, :614.7; Drugs and poisons, :615; Textile and other Manufactures, :67; and other mercantile affairs in :658 or scattered through the various divisions from :62 to :69

578:6j9 Criminal cases. Cf. Medical Jurisprudence, :614.23

.1 Forgery. Cf. :6j3.8

.2 Counterfeiting

.5 Poisoning. Cf. Micro-Chemistry, :54, and Poisons, :615.9

.6 Wounds

.63 Blood stains. Cf. :6j2.5

.65 Extraneous matters

.68 Powder grains and stains

3, Kind of weapon and ammunition

5, Distance of shot

:61 The Microscope in Medicine

[Medical Microscopy]

:016, Bibliography

0.1, Philosophy, Theories; .2, Compends, Treatises; .3, Dictionaries; .4, Essays, Addresses; .5, Periodicals; .6, Societies; .7, Educational; .72, Laboratories, Dissection, Experiments, Vivisection; .73, Bacteriology, to :583.3, or transferred here, if desired, for medical libraries; .74, Museums; .77, Teaching; .8, Collective works; .9, Medical History; .91, Medical Travels; .92, Medical Biographies

:611 Human Anatomy and Histology

This section parallels Comparative Anatomy, :591.4, and it is often preferable to combine the two, a medical specialist putting all here, and others putting all together in Zoology.

.012 Teratology

.013 Embryology

.013,11 Semen. ,15, Ovum

.013,3 Embryo. ,68, Blood. ,8, Adnexa

.018 Histology

1, The Cell; 2, Connective Tissue; 3, Cartilage; 4, Bone; 5, Blood; 6, Muscle; 7, Epithelium; 8, Nervous System; 81, Ganglia; 86, Nerves

578:611.1 Circulatory System
.2 Respiratory System
.3 Digestive System
.36, Liver; 7, Pancreas; 8, Peritoneum, Mesentery, Omentum
.4 Glandular and Lymphatic System
1, Spleen; 2, Vessels, ducts; 3, Thymus; 4, Thyroid; 5, Suprarenal gland; 6, Lymphatic glands
.6 Genito-Urinary System
1, Kidneys, ureters; 2, Bladder, urethra; 3, Testis, vas deferens, scrotum; 4, Penis; 5, Ovary, ducts; 6, Uterus; 7, Vagina, vulva; 9, Mammae
.7 Motor and Integumentary Organs
.77 Skin
.78 Hair. Nails
.8 Nervous System
.9 Regional Anatomy and Histology
:612 The Microscope in Physiology
:614 In Hygiene and Sanitation
.23 Medico-Legal Relations
Medical Jurisprudence will doubtless be put here most conveniently by most microscopists and physicians
.3 Adulterations, etc.
.31 Examination of Food
.32 Milk and Milk Products
.34 Beverages
.7 Impurities of Air and Ground
.71 Pollution and Injuries by Dust, Smoke, etc.
.78 Air in Country, Towns, Crowds, Parks, Roofs, etc.
.79 Air on Mountains, Snow-fields, Sea, Polar regions
:615 The Microscope in Pharmacy